

Abstract Submitted
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High-Performance Kinetic Plasma Simulations with GPUs and load balancing KAI GERMASCHEWSKI, NARGES AHMADI, STEPHEN ABBOTT, LIWEI LIN, LIANG WANG, University of New Hampshire, AMITAVA BHATTACHARJEE, WILL FOX, Princeton University / PPPL — We will describe the Plasma Simulation Code (PSC), a modern particle-in-cell code with GPU support and dynamic load balancing capabilities. For 2-d problems, we achieve a speed-up of up to $6\times$ on the Cray XK7 “Titan” using its GPUs over the well-known VPIC code, which has been optimized for conventional CPUs with SIMD support. Our load-balancing algorithm employs a space-filling Hilbert-Peano curve to maintain locality and has shown to keep the load balanced within approximately 10% in production runs which otherwise slow down up to $5\times$ with only static load balancing. PSC is based on the LIBMRC computational framework, which also supports explicit and implicit time integration of fluid plasma models. Applications include magnetic reconnection in HED plasmas, particle acceleration in space plasmas and the nonlinear evolution of anisotropy-based kinetic instabilities like the mirror mode.

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